

ANALYSIS OF PROFITABILITY OF VEGETABLE PRODUCTION DURING AND AFTER COVID-19 LOCKDOWN IN SOUTHWEST NIGERIA

Olutope Stephen OJO¹, Temidayo Gabriel APATA²

¹Adekunle Ajasin University, Agricultural Economics Department, Akungba-Akoko, Ondo State, Nigeria, Phone number : +2349030001700, E-mail: topejo7777@gmail.com

²Federal University, Agricultural Economics and Extension Department, Oye-Ekiti, Ekiti State, Nigeria, E-mail: dayo.apata@fuoye.edu.ng

Corresponding author: topejo7777@gmail.com, olutope.ojo@aau.edu.ng

Abstract

The study examined the profitability of vegetable farming during and after the Covid-19 lockdown in Southwest Nigeria. It specifically addressed the socioeconomic characteristics of the farmers, the estimated cost, and the returns of vegetable production both during and after the COVID-19 lockdown determined the factors influencing production of vegetables. A Multistage random sampling was employed in the study. The first stage was a random selection of three (3) States from the six (6) States in South West, Nigeria. Three (3) Local Government Areas were randomly chosen from each selected State. Two (2) communities were sampled randomly from each of the Local Government Areas selected and random sampling of fifteen (15) farmers from each community, giving a total of 270 respondents. Descriptive statistics, Budgetary analysis and Ordinary least squares (OLS) Regression Analysis were applied to data collected. The result showed that majority (41.9%) of respondents were in the active age with the mean age of 42 years. Majority (67%) of the respondents were male with household size ranging between 4 and 6 persons. About (64.1%) were married with an average year of farming experience of 31 years. The profitability analysis revealed the net farm income realized during and after COVID-19 was N124,393.9 and N258,587.3 per hectare, respectively. According to the calculation of the gross margin, the value per hectare during and after COVID-19 was N146,219.8 and N270,374.4, respectively. During and after COVID-19, the Benefit Cost Ratio was 2.85 and 4.6 which indicate that for every one naira spent, ₦2.85 and ₦4.6 will be realized as revenue respectively, implying that vegetable production is profitable in the study area. Results of the regression(OLS) analysis showed the basic variables that significantly influenced profit generation during COVID-19 scenario are quantity of vegetable output, gender of the farmer, farmers year experience and cost of labour while variables that influenced profitability after COVID-19 are quantity of vegetable output, gender of the farmer, marital status, household size and access to credit. The study also revealed the major farmers' perception about COVID-19 as it disrupted Supply chain of vegetables, caused harvest losses for vegetable farmers, reduced vegetable farmers' income during the lockdown and income reduction was ranked 1st among various perceptions observed. The study found that as the age of vegetable farmers increases, their profit decreases across all production scenarios, a policy that focuses on ways to attract and encourage young people who are agile and strong to start growing vegetables will help to boost technical efficiency and their income. Education should also be encouraged among vegetable farmers in the study area since the study revealed that education will enable them to adopt new technologies that will make them to have more profit from their production.

Key words: effects, COVID-19, lockdown, vegetables, production, South-west, Nigeria

INTRODUCTION

Coronavirus Disease 2019 (COVID – 19) was first surfaced in the Chinese city of Wuhan in December 2019. Dr. Li was the first to identify the virus, and the disease soon spread to a worldwide scale, prompting the World Health Organization (WHO) to designate the disease a pandemic on March 11, 2020 (WHO, 2020) [32]. The disease's rapid

expansion has drew the attention of medical professionals, academics, and other researchers all over the world, who are trying to figure out the cause, how it spreads, and what can be done to stop it. COVID - 19 is active and stable at temperatures below 6 degrees Celsius, but loses potency as the temperature rises, according to Madhukalya and Kapoor (2020) [19, 17]. Warmer weather, according to Russman et. al (2020) [26], may

impede the spread of this virus however, not everywhere in the globe. The COVID-19 epidemic was caused by the SARS-CoV-2 virus (formerly known as Corona virus). Since World War II and the founding of the United Nations, the COVID-19 pandemic has presented the world with its biggest challenge (UN, 2020) [29]. It is believed to have started in Wuhan, Hubei Province, China, in December 2019. COVID-19 is still spreading over the world. China initially served as the outbreak's focal point, with cases being reported there or among Chinese tourists. On February 27, 2020, the first verified case of the 2019 coronavirus pandemic in Nigeria was disclosed, when an Italian citizen in Lagos tested positive for the virus (NCDC, 2020) [21]. Clearly, the emergency is medical or epidemiological in origin. This outbreak, is assumed to have direct and indirect effects on household food security, livelihoods, and economic activity in Nigeria and the rest of the countries. The effect of the Corona virus outbreak on food security is projected to grow in scope, scale, and severity as the pandemic continues. Furthermore, the pandemic is occurring in areas where food insecurity is already a major issue. The government imposed urgent adaptation of standard physical distancing and lockdown strategies, especially in urban centers, rural settlements, and places affected by active pandemics, to avoid adding a food crisis to the existing health crisis, which would otherwise exacerbate the pandemic's negative effects.

Due to the COVID-19 pandemic's transportation restrictions and lockdown, there was a labor shortage that reduced agricultural output (Ayetoro, 2020) [6]. The impact of the COVID-19 pandemic on agriculture has grown in importance with the pandemic's worldwide spread in the context of contemporary agricultural development. Numerous angles have been used to study how the pandemic has affected agribusiness (Henry 2020; Morton 2020) [13, 20]. Smallholders farmers in Nigeria were taken aback when the government imposed a lockdown at the end of March. Security personnel imposed mobility restrictions indiscriminately over the country, many

farmers could not access their fields. Farmers' access to markets was severely hampered as well. Because most small-scale farmers lack storage facilities, they were forced to either let their vegetables rot or sell them for a low price to unscrupulous intermediaries. Vegetables are essential for human nutrition because they provide essential vitamins, minerals, and fibre. They are essential antioxidant foods that are also extremely beneficial for improving fitness and preventing sickness. They include cherished food components that may be used to successfully accumulate and rejuvenate the body. Vegetables are important for maintaining the body's alkaline reserve. Their high vitamin and mineral content is the key reason for their popularity. Vegetables come in a variety of shapes and sizes. Edible roots, stems, leaves, fruits, and seeds are all possibilities. Each group makes a unique contribution to the diet. Fleshy roots have a high energy content and are high in vitamin B. Carbohydrates and proteins are abundant in seeds. Minerals, vitamins, and water are abundant in leaves, stems, and fruits. Vegetable consumption in Nigeria is increasing year after year, owing to a growing appreciation of their nutritional value (Osalusi, 2019) [25]. Exotic vegetables are a distinct category of vegetables in Nigeria. They're well-known for their distinct flavor, nutritional content, and health advantages. They aid in maintaining the body's fluid equilibrium. Vegetable production as a small-scale enterprise can financially empower the underprivileged, particularly women with little capital, access to land, and labor constraints (Lewis, 1997) [18]. They are well-known for their distinct flavor, nutritional content, and health advantages. They contribute greatly to home food security and enable women achieve some degree of financial freedom within the family budget with the money they offer.

Problem statement

COVID-19 and the associated economic issues, according to many studies, will lead to a global food catastrophe, mainly in Africa, if the food system is unable to adapt (Blanke,

2020) [7]. According to previous studies, half of Africans are already food insecure, with half of them being seriously food insecure, and the number of hungry people is expected to treble by 2020. According to several research, the African continent is already facing food security issues (Blanke, 2020) [7]. African farmland is already being impacted by locust swarms in the Horn of Africa, local conflict, insecurity, and drought brought on by climate change. These catastrophes cause the loss of crops and incomes for millions of smallholder farmers in Africa (Brookings, 2020) [8]. Aside from that, the COVID-19 pandemic's arrival has weakened and exacerbated current output and distribution capacity, particularly in SSA (Blanke, 2020) [7]. The difficulties facing Africa during and post COVID-19 pandemic are grave, necessitating major actions focused on critical sectors in order to speed the reform of the food system and reduce rising food insecurity and poverty. According to the 2019 Global Food Report, world hunger is on the rise (WFP, 2019) [30]. Poverty and hunger are increasing in practically all African sub-regions, making Africa the region with the highest prevalence of hunger, with an increasing proportion of farming households experiencing food insecurity (GODAN, 2020) [11]. The 2019 edition demonstrates that considerable obstacles remain in the fight against food insecurity and poverty in all forms.. The arrival of COVID-19 has exacerbated the country's food crises and severe poverty levels. This consequence is quite concerning, as it jeopardizes the livelihoods of the world's poorest people, the majority of whom rely on agriculture (GODAN, 2020) [11]. The COVID-19 has already increased the likelihood of acute food insecurity for most farming households (GODAN, 2020) [11]. During times of crisis, the world's poorest people are more likely to run out of food, resulting in hunger and, in extreme cases, going days without eating, putting their health and wellness at risk (FAO, 2019) [9]. The COVID-19 epidemic has had major effect on the production and supply chain of vegetables. Let's take the delivery of vegetables as an example. In Nigeria, the

delivery of vegetables from the fields to the consumer includes a number of stages, including production, transportation, wholesale, and retail. Vegetable output has decreased as a consequence of the pandemic's impact on production and the supply chain, which has also caused problems. Furthermore, vegetable production is unappealing due to the time-consuming processes involved, and high production costs are relatively high due to the relative high cost of labor, input costs, and supply chain complications caused by the impact of covid-19, affecting farmers' income and standard of living.

As a result, this study investigates the impact of COVID-19 lockdown on vegetable farmers and their income generation in Southwest, Nigeria. Consequently, this study seeks and hopes to provide answers to the following pertinent research questions such as:

- (i) what are the socio-economic characteristics of the vegetable farmers in the study area?
- (ii) what are the costs and returns of vegetable production during and after the lockdown?
- (iii) what are the factors influencing the profitability of vegetable in the study area?
- (iv) What are perceived effects of covid-19 lockdown on production of vegetables in the study area?

Objectives of the Study

The general objective of the study is to investigate the effect of COVID-19 lockdown on vegetable production and farm-income generation in Southwest, Nigeria. Specifically, the research objectives are to:

- (i) describe the socio-economic characteristics of the vegetable farmers in the study area;
- (ii) estimate the cost and return of vegetable farmers during and after the COVID-19 lockdown;
- (iii) determine the factors influencing the profitability of vegetable in the study area;
- (iv) ascertain the perceived effect of covid-19 on production of vegetable in the study area.

Justification

The coronavirus (COVID-19) pandemic has had a significant impact on Nigeria's economy, particularly the agricultural industry and farm households. Due to the lockdown, mobility restrictions, reduced availability of

labor and other inputs, and reductions in output prices resulting from drops in demand for commodities in specific market segments, farm enterprises have encountered production problems. Farm households may also be harmed by the loss of salaries and benefits from off-farm labor, which they rely on to fund farm production demands, household living expenses, investments, and debt payments. While various studies have looked at how the pandemic might affect global and national economic indicators like global poverty, government spending, GDP growth, budget deficits, and employment (ILO 2020a; ILO 2020b; Nicola et al. 2020; Sumner et al. 2020; UN-Habitat and WFP 2020; World Bank 2020) [15, 16, 22, 27, 28, 31, 33]. There is a scarcity of data on how the epidemic and attendant lockdown restrictions impacted individuals in farm households. As a result, it's difficult to comprehend the repercussions and support mechanisms at the farm household level that can be used to assure income smoothing. Furthermore, given the high degree of unpredictability in the spread of the COVID-19 infection and the severity of the effects at the international level, a comprehensive analysis of the pandemic's impact on socioeconomic characteristics, agriculture, dietary intake, and food security is not yet available as far as we know, owing to the fact that the pandemic is still ongoing globally. As a result, it is critical to comprehend COVID-19's immediate socioeconomic ramifications, as well as how COVID-19 will affect the earnings and standard of living of vegetable farmers. This study, which will contribute to the growing body of literature on the COVID-19 pandemic, looked at the financial effects of the COVID-19 outbreak and the induced lockdown restrictions in South-West Nigeria, as well as the implications on vegetable farmers and their income with their standard of living. Based on the effect of the lockdown on their quality of life, the results will aid researchers in better understanding the urgent needs of farm families in rural areas as well as the variables that affect their ability to generate income. The results will also be used

as a supplement to existing knowledge to inform policy talks about farmers' livelihood coping mechanisms during the COVID-19 pandemic and to support decision-making on how to protect the livelihoods of vegetable growers who are the most vulnerable to the pandemic. This study will also act as a roadmap for other academics who want to do more research in this area.

As a result, the purpose of this research is to look at the economic losses caused by the COVID-19 pandemic in terms of agricultural labor loss, income generation, and other accounting expenses like labor cost, as well as to offer potential solutions for addressing the COVID-19 pandemic's effects on farmers in Southwest Nigeria who produce vegetables..

MATERIALS AND METHODS

The Study Area

The research was done in Southwest, Nigeria using a representative selection of 3 states. The zone is made up of six States which are; Ekiti, Ondo, Osun, Ogun, Oyo and Lagos, while the representative states are Lagos, Osun and Ekiti. The area lies between longitude 30° and 7°E and latitude 4° and 9°N with a total land area of 77,818 km². National Population Commission, (2007) reported that 27,511,892 people lived (14,049,594 males and 13,462,298 females) in Southwest, Nigeria. It has two distinct seasons which are: rainy season (April-October) and dry season (November-March). The temperature of the zone ranges between 21 and 28 degree centigrade (°C) with high humidity of 77 percent. Hence, crops and livestock production are done with little problems in the area. The major occupation of the people is agriculture. The other occupations include trading, driving, carpentry, etc. The official language is English, while the major informal language for communication in this region is Yoruba, which has different dialects. The choice of the selected states is due to the following:

-*Lagos state*: (i) was reported as the most hit and is the economic hub of the region, (ii) High number of vegetable farmers with several flooded areas useful for the production

of vegetable farmers especially during the non-rainy sessions;

-*Osun state* (i) Third most hit state in the regions of the COVID-19 pandemic and one of the economic hubs of the region, (ii) Highest number of vegetable farmers with several flooded areas useful for the production of vegetable farmers especially during the non-rainy sessions.

- *Ekiti State*: (i) this state has been reported as the least hit and relative economic activities hub of the region (ii) Moderate number of vegetable farmers with highest number of irrigated vegetable farming.

Sampling Technique

A multi-stage sampling technique was employed to select respondents for the study. There are six (6) States in South West of Nigeria, namely Ondo, Osun, Ekiti, Ogun, Lagos and Oyo. At the first stage, three (3) States were randomly selected (Osun, Ekiti and Lagos) out of the six (6) States.

In the second stage, three (3) Local Government Areas (regions renowned for their vegetable farming) were randomly chosen from each of the states that had been chosen. A total of two (2) communities from each Local government area were chosen at random for the third stage. During the final stage, a random selection of fifteen (15) farmers in each community. In all, a total of two hundred and seventy (270) respondents were selected for the study.

Data Analysis

Data for analysis were generated primarily using interview scheduled and structured questionnaires administered to two hundred and seventy (270) respondents selected for the study.

Analytical Technique

Using both descriptive and inferential statistics, the study's data were examined. Descriptive statistics like mean, percentages, and frequency distribution were used to evaluate Objectives I and IV. Using budgetary analysis, objective II was examined.

With the help of (OLS) regression, objective III was examined.

Model Specification

The gross margin analysis was used to estimate the profitability of vegetable production across several production scenarios. According to previous research, gross margin is the difference between total revenue (TR) and total variable cost (TVC). According to previous research, the bigger the gross margin, the higher the profit earned by vegetable producers. As a result, the analyses' mathematical notation is shown below:

$$GM = TR - TVC \dots\dots\dots(1)$$

GM stands for gross margin,

TR for total revenue,

and TVC for total variable cost (these are the expenses incurred in production that does not depend on the level of output). These include costs of chemical, fertilizers, labour and seeds.

P_q = Price of the Vegetable per kg,

q P_{cm} = Market price of variable input.

Also, the Net Revenue (NR) was calculated using the formula as follows:

$$NI = TR - TC \dots\dots\dots(2)$$

The net income model is expressed as below:

$$TC = TFC + TVC \dots\dots\dots(3)$$

$$NI = TR - TC$$

$$\text{Cost Benefit Ratio} = TR/TC$$

where:

NI = Income in Naira/ha

TR = Total Revenue in Naira/ha

TC = Total Cost

TFC = Total Fixed Cost

where: TFC = Total fixed costs.

TVC = Total Variable Cost in Naira/ha

TVC = Gross Margin in Naira/ha.

Ordinary Least Square Regression Model (OLS)

The OLS regression analysis was employed to ascertain factors influencing vegetable production as applied in Fakayode et.al. (2011) [10].

The model is specified as:

$$Y = f(\beta X + \mu_i) \dots \dots \dots (4)$$

where:

Y_i = Total farm output in kilogram

β = parameters to be estimated

X = explanatory variables

U_i = error term

The model is specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu_i \dots \dots \dots (5)$$

where:

Y = Total farm output in kilogram

The explanatory variables used in the analysis are:

X₁ = Farm size (ha)

X₂ = Farm experience (years)

X₃ = Level of education

X₄ = Cost of labour

X₅ = Household size (number of persons in the household)

X₆ = Access to credit (Yes = 1, No = 0)

X₇ = Transportation

X₈ = Output (kg)

X₉ = Gender

X₁₀ = Age (years)

X₁₁ = Marital Status (Married=1; Otherwise = 0)

RESULTS AND DISCUSSIONS

Socio-economic characteristics of the farmers

Table 1 shows that vegetable production is gender dependent given that majority of the farmers were male (67%) and the remaining ones were females, implying that males were more involved in vegetable production enterprise than their female counterparts. The results revealed The result revealed that majority (41.9%) of the famers were between 41 and 50 years of age, out of which male farmers were 35.2% and female vegetable farmers were 6.7%. By implication, the result depicts that vegetable farmers are relatively young, active and have agility to carry out farming activities and the mean age is 42 years, which simply implies that the vegetable farmers in this region were still in an era when they can work. The findings imply that most respondents were in their middle years, falling

within the Food and Agriculture Organization's stated age range of 30--50 for agricultural productivity (FAO, 1997; 2005).The results reveal that majority of the respondents (64.1%) were married while single, widowed and divorced respondents are (16.7%), (6.3%) and (12.9%) respectively.

This is an indication that Married people dominated the activities in the study region. The marital status of a farmer may have a substantial impact on production decisions, according to Omolehin et al., 2007[24]. The majority of respondents, it was discovered by the results, were married. They believed that married individuals were most likely to have the best capacity in traditional African society, which would result in higher output/income. The result showed that majority of the farmers were fairly educated with 22.2%, 25.2% and 19.6% having primary, secondary and tertiary education respectively. This means that the farmers had minimum level of education that could enable them to adopt and search for the latest innovation and agricultural technology in vegetable production. This is in agreement with the findings of Akinbile (2003) [3], who reported that educational level of respondents enhances their comprehension of technical information and hence influence their profitability and production.The result further revealed that majority (50%) of the respondent had a farm size between 2.5ha and 4 ha out of which male vegetable farmers were (37.4%) and about (12.3%) were female. About 38.1% of them had a farm size less than 2 ha, while 11% had between 4.5ha and 6ha, with the average mean farm size put at 3 hectares, this implies that production could be improved upon as 3 hectare per average household of 5 persons is on the low side. The result is similar to that of Apata et al. (2011) [5], who posited that subsistence farmers play an important role for food security with an average farm size ranges between 1-3 hectares. Since the majority of respondents have farm holdings of less than 3 hectares, it means that these farmers cannot achieve economies of large-scale production. Small farm size is an impediment to agricultural

mechanization because using farm machineries like tractors to control weeds will be difficult. The results revealed that majority (41.9%) of the respondent had been engaged in vegetable production for less than 10 years. Also, about (5.2%) of the respondent had farming experience between 21 and 30 years, only (11.5%) had 11 years and above as farming experience, while about (41.5%) of the respondent had engaged in vegetable production for 31 years and above. According to Adebayo (2006) [1], the longer a person stays on a particular job, the better the job performance tends to be. The result further showed that majority (86%) of the vegetable farmers stated they had been refused access to credit facilities for their farming operations in the study region. About 63.6% of vegetable

farmers were male, compared to about 23.4% of female farmers without recourse to credit. This suggests that the targeted vegetable producers in the study area have very limited access to credit facilities or that those facilities are most likely not reaching them. This finding is not encouraging because it raises the possibility that the farmers in the study region will produce less and make less money if they have restricted access to credit. Thus, Okoh et al (2015) [23], found that the major factors responsible for decline of production and profitability are inadequate credit facilities and low capital. Ajah et.al. (2017) [2] stated that limited access to credit perpetuates poverty and low quality of life among farmers who may wish to adopt more profitable innovations.

Table 1. Socio-economic Characteristics of the Respondents

Variables	Male	Percentage	Female	Percentage	Mean
Age(Years)					
01 – 30	15	5.6	28	10.4	42
31 – 40	5	1.9	14	5.2	
41 – 50	95	35.2	18	6.7	
51 – 60	38	14.1	15	5.6	
>60	42	15.6	0	0.0	
Marital status					
Married	149	55.2	24	8.9	
Divorced	22	8.1	13	4.8	
Widowed	17	6.3	0	0.0	
Single	7	2.6	38	14.1	
Level of Education					
No formal	68	25.2	21	7.8	
Primary	60	22.2	0	0.0	
Secondary	28	10.4	40	14.8	
Tertiary	39	14.4	14	5.2	
Farm size(ha)					
<2	76	28.1	27	10	
2.5 – 4	101	37.4	34	12.6	
4.5 – 6	18	6.7	14	5.2	
Farming Experience					
<10	78	28.9	35	13	
11 – 21	72	26.7	40	14.8	
21 – 31	14	5.2	0	0.0	
>31	31	11.5	0	0.0	
Access to credit					
No	169	62.6	63	23.4	
Yes	26	9.6	12	4.4	

Source: Field survey, 2021.

Estimated Costs and Returns on vegetable production during and after covid-19 in the study area

According to the findings of the profitability analysis (Table 2), the study area's Total Variable Cost (TVC) per hectare for vegetable output before and after COVID-19 was

N51,239.45 and N58,486.7, respectively. The majority of the costs incurred during vegetable production in the study region are comprised of the expenditure used in the production of vegetable in the study area. Among the variable costs recorded by the vegetable producers, land clearing recorded

the highest cost during covid-19 as ₦12,514.25 representing 17% per hectare of the overall cost of production. Additionally, after COVID-19, plowing expenses accounted for the highest variable cost paid in the production of vegetables, totaling 29.3%.

From the results, , the net farm income realized by a farmer during and after covid-19 accounted for ₦124,393.9 and ₦258,587.3 per hectare respectively. The gross margin analysis revealed a value of ₦146,219.8 and ₦270,374.4 per hectare during and after covid-19 respectively. The positive values obtained during and after Covid-19 indicated that In the study region, growing vegetables is a successful business. The revenue generated by the cultivation of vegetables in the study region is not significantly different from the revenue generated by the cultivation of a different exotic vegetable (watermelon) in the states of Ekiti and Borno, respectively. In Ekiti State, according to Ajewole (2015) [4], the gross margin for vegetable production was N138,044.22 per hectare, while in Borno State, according to Ibrahim (2011) [14], the gross margin for vegetable production was N105,002.95 per hectare. It was discovered that the yield on invested naira was 1.70 and 3.68 during and after COVID-19, respectively. This means that during COVID-

19, a farmer in the study area earned N1.70K in profit for every N1 invested in vegetable produce, while the area also saw a return of N3.68K after COVID-19. The Benefit-to-Cost Ratio of ₦2.85 and ₦4.6 during and after covid-19 also indicate that for every one naira spent , ₦2.85 and ₦4.6 will be realized as revenue respectively and so farmers in the region can go on with production of vegetable.

Gross Margin (GM) = TR –TVC (During Covid-19)

$$= \text{₦}197,459.20 - \text{₦}51,239.45 = \text{₦}146,219.80.$$

Gross Margin (GM) = TR – TVC (After Covid-19)

$$= \text{₦}328,861.10 - \text{₦}58,486.70 = \text{₦}270,374.40$$

Therefore,

Benefit Cost Ratio(BCR) =Benefit/Cost (During Covid-19)

$$= \text{₦}146,219.80 / \text{₦}51,239.45 = \text{₦}2.85.$$

Benefit Cost Ratio(BCR) =Benefit/Cost (After Covid-19)

$$= \text{₦}270,374.40 / \text{₦}58,486.70 = \text{₦}4.6.$$

Return on Investment = Net Return/Total Cost (Before Covid-19)

$$= \text{₦}124,393.90 / \text{₦}73,065.29 = \text{₦}1.70.$$

Return on Investment = Net Return/Total Cost (After Covid-19)

$$= \text{₦}258,587.30 / \text{₦}70,273.78 = \text{₦}3.68$$

Table 2. Estimated Cost and Return of Vegetable Production During and After Covid-19

Description	During Covid-19 Lockdown	% of Total Cost	After Covid-19 Lockdown	% of Total Cost
Variable Cost				
Land Clearing	₦12,514.25	17.1	₦15,354	21.8
Ploughing	₦15,800	21.6	₦20,580.5	29.3
Chemical Application	₦2400	3.3	₦3,000	4.3
Fertilizer	₦5,000	6.8	₦4,500	6.4
Herbicides	₦7600	10.4	₦8,402.05	12
Transportation	₦5,625.2	7.7	₦4,800	6.8
Seed	₦2,300	3.1	₦1,850.2	2.6
Total Variable Cost	₦51,239.45	70.1	₦58,486.7	83.2
Fixed Cost				
Cutlass	₦3,800	5.2	₦1,200	1.7
Hoe	₦3,250.5	4.4	₦890.5	1.3
Depreciation on Knapsack Sprayer	₦4,850	6.6	₦6,200	8.8
Depreciation on Wheelbarrow	₦8,000.15	10.9	₦1,098.5	1.6
Depreciation on Watering Can	₦1,925.19	2.6	₦23,98.08	3.4
Total Fixed Cost	₦21,825.84	29.9	₦11,787.1	16.8
Total Cost	₦73,065.29	100	₦70,273.8	100
Total Revenue	₦197,459.2		₦328,861	
Net Return	₦124,393.9		₦258,587	
Gross Margin	₦146,219.8		₦270,374	
Return to Investment	1.7		3.68	

Source: Field survey, 2021.

Factors Influencing Profitability of Vegetable during COVID-19 Lockdown in the study Area

Table 3 displays the results of the regression estimates for the variables influencing vegetable output in the study area during COVID-19 lockdown. The criteria used in the selection of the lead equation are economic, statistical and econometric criteria, which specifically considered t-ratio, F-value, R^2 , Adjusted R a priori expectations and significance of the estimated coefficients. The R^2 value of 0.61 implies that 61.0% of the total variation in the quantity generated of vegetable produced. The regression estimates revealed that output (X_8), gender of the farmer (X_9), farmers year experience (X_7), level of education (X_3), cost of labour (X_4) had a significant influence on the profitability of vegetables in the study region during COVID-19 Lockdown. The amount of output generated had a positive significant impact on vegetable farming profit and was statistically significant at 1%, meaning an increase in output of 1 kg would result in a 0.61 increase

in profit. The likelihood of being a male vegetable farmer will result in an increase in profit by a coefficient of 47,168.43. Gender of vegetable farmers had a positive association with vegetable output. The 7,059.89 coefficient will result in a rise in profit. Farmers' years of experience in vegetable production had a positive association with profitability.

Also, Education is significant at 1percent, which implies that a unit increase in years spent in formal education will bring about the coefficient of 299,66.43 increase in profit from vegetable farming. Cost of labour had a positive significant on profit from vegetable farming. This implies that a naira increase in cost of labour will give rise to an increase in profit on vegetable production by the coefficient of 212,661.70, the result showed that increase in cost of transporting vegetable from production point to the point of sale will bring about more than the respective increase in sale price which in turn generate a higher profit.

Table 3. Factors Influencing Profitability of Vegetable Production during COVID-19 Lockdown

Variables	Coefficient	Standard error	P-value
Constant	-429,212.1	0.22	0.005
Farm size(X_1)	8,155.88	10,575.89	0.000
Farming Experience(X_2)	7,059.89**	7,526.46	0.659
Level of Education(X_3)	29,966.43**	89,153.09	0.367
Cost of Labour(X_4)	212,661.70*	21,523.37	0.302
Household size(X_5)	22,213.53	10,430.65	0.782
Credit access(X_6)	-41,022.19	1,182.56	0.000
Transportation(X_7)	-146.56	11,660.09	0.010
Output(X_8)	0.61**	70,870.27	0.563
Gender(X_9)	47,168.43**	94,221.55	0.024
Age(X_{10})	3,318.64	98.71	0.138
Marital status(X_{11})	-80,358.28	0.02	0.014
R^2	0.61		

Prob > chi2 =0.000

Dependent variable: Profitability

Significant: ** represent 1% significant level, * represent 5% significant level.

Source: Field survey, 2021.

Factors Influencing Profitability of Vegetable after COVID-19 Lockdown in the study Area

Table 4 shows that X_8 , X_9 , X_{11} , X_5 X_6 are significant variables that significantly influenced the profitability of vegetables after the COVID 19 Lockdown in the research area: quantity of output, farmer gender,

marital status, family size, and access to credit. All of the postulated explanatory variables explained the variation in the respondents, according to the estimated adjusted R^2 of 0.92. The quantity of vegetable produce (output) is statistically significant at 1 percent level of probability, implying that a unit increase in kg of vegetable produce will

increase the profit by the coefficient of 0.92. The result also showed that the coefficient of farmers age has an inverse relationship on vegetable net return and it is significant at 1% level.

According to this, the impact of respondent age on the profit of vegetables in the study region is lessened as respondent age increases. The result also indicated that if the farmer age is increased by 1 year, there will be a decrease of 38,199.47 coefficient in his or her profit.

Marital status is significant at 5 percent and positively correlated with the profit of

vegetable farmers. The likelihood of being a married vegetable farmer increases the profit by a coefficient of 8595.20. Household size had a positive impact on vegetables profit, with a statistical significance level of 1%. The profit of vegetable farmers will rise by 95,180.05 coefficient as family size rises. At a 5% level of probability, farmers' access to credit is significant and positively correlated with their profitability. This suggests that having access to credit will allow farmers to grow vegetables on a big scale, thereby increasing their profits.

Table 4. Factors Influencing Profitability of Vegetable Production after COVID-19 Lockdown

Variables	Coefficient	Standard error	P-value
Constant	165,092.6	132,387.9	0.212
Farm size	51,381.073	33,084.7	1.553
Farming Experience	-452.84	1,409.88	0.748
Level of Education	9,428.46	10,154.54	0.353
Cost of Labour	-0.01	0.09	0.942
Household size	5,110.45**	898.15	0.000
Credit access	9,518.05*	3,792.05	0.011
Transportation	-1,024.726	1,090.03	0.94
Output	0.92**	0.15	0.000
Gender	-231.65	1,757.78	0.895
Age	-38,199.47*	17,647.9	0.031
Marital status	-8,595.20*	3,508.25	0.014
R ²	0.92		

Dependent variable: Profitability

Significant: ** represent 1% significant level, * represent 5% significant level.

Source: Field survey, 2021.

Table 5. Distribution of the Respondents based on their perceptions in the Region

Perceptions	Strongly Disagree		Disagree		Agree		Strongly Agree		Mean	Rank
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.		
Covid-19 reduces vegetable farmers' income because of lockdown	38	14.07	38	14.07	109	40.4	85	31.5	8.7	1 st
Covid-19 affects farming activities negatively because of lockdown	22	8.15	39	14.4	153	56.7	55	20.4	8.7	2 nd
Covid-19 disrupts Supply chain of vegetables because of lockdown	50	18.52	62	22.96	65	24.1	93	34.4	8.6	3 rd
Covid-19 will affect availability of labor for land preparation	43	15.93	22	8.15	188	69.6	17	6.3	8.2	4 th
Covid-19 causes harvest losses for vegetable farmers because of lockdown	35	12.96	53	19.63	95	35.2	87	32.2	8.4	5 th
Covid-19 reduces vegetable farmers yields in the upcoming harvest	38	14.07	32	11.85	145	53.7	55	20.4	8	6 th
Covid-19 causes lack of trust on the government because of lockdown	71	26.3	51	18.9	107	39.6	41	15.2	2.8	7 th
Covid-19 affect the quality of vegetables for sales	64	23.7	41	15.2	101	37.8	64	23.7	7.5	8 th
Covid-19 reduces ability to plant vegetables in the next planting season	44	16.3	137	50.74	60	22.2	29	10.7	6.8	9 th
Covid-19 affects sales of farm inputs	168	62.2	58	21.5	30	11.1	14	5.2	4.8	10 th

Source: Field Survey, 2021.

Farmers' Perceived Effect of COVID-19 on Vegetable Production in the Region

Table 5 reveals that the perceived effect of covid-19 on vegetable farmers in the study

area. The result revealed that reduction in income was ranked as the 1st major perceived effect of covid-19 by the farmers ($\bar{x} = 8.70$). During the pandemic, it is obvious that vegetable producers' revenue fell. In light of this, farmers' annual incomes were significantly impacted by the pandemic's drop in farm income. Reduction in farmers yield was ranked the 2nd perceived effect of covid-19 by the respondents by ($\bar{x} = 8.60$), Due to the lockdown, the vegetable producers were unable to cultivate their crops efficiently during the growing season, which had an impact on their crop yield for the following season. Farmers of vegetables felt that the main effects of COVID-19 were post-harvest losses and supply chain disruption due to the shutdown.

This agrees with the findings of Hai-ying et al. (2021) [12] who reported that reduction in farmers income was the major effect of pandemic on vegetable farmers.

CONCLUSIONS

The study reveals that in Nigeria's southwest, vegetable production is profitable. It shows that the profitability of vegetables during the COVID-19 Lockdown was significantly influenced by the quantity of vegetables produced, the farmer's gender, his or her years of experience, and the cost of labor, while the profitability of vegetables after the COVID-19 Lockdown was significantly influenced by the farmer's gender, marital status, household size, and access to credit. The research also showed that the farmers in the study area ranked the loss of income due to lockdown as the first major effect they observed. The study's mean value for this effect was ($= 8.70$) while the least ranked perceived effect was unavailability of farm inputs with mean value ($\bar{x} = 4.8$) during COVID-19 lockdown.

The preceding analysis has brought some findings that have implications for this research work. Based on these findings, the following recommendations were made to increase the profit from the production of vegetable by the farmers in the study area:

(i) Because the study found that as vegetable farmers' age increases, their profit decreases across all production scenarios, a policy that focuses on ways to attract and encourage young people who are agile and strong to start growing vegetables will help to reduce unemployment since the production of vegetable in the study area is profitable.

(ii) Age, education, marital status, labour costs, household size, farm size, and access to credit facilities are just a few of the socioeconomic factors that greatly influence vegetable production and profit generation in the study region. It is important to give all of these serious consideration.

(iii) Given that this situation was seen in the study region, the government should support and provide women with the tools they need to produce vegetables in order to address gender disparities.

(iv) Farmers' perceptions of the COVID-19 lockdown across the research area should also be taken into account in order to avoid any reduction in vegetable output in the event of a future pandemic.

(v) Availability and allocation of large farm size should be encouraged among farmers so as to enhance their participation in vegetable production activities for higher profit since majority of them still engage in small farm size in the study area.

(vi) Education should also be encouraged among vegetable farmers in the study area since the study revealed that education will enable them to adopt new technologies that will make them to have more profit from their production.

(vii) In order to secure enough production and profit generation, the government should always permit free movement of vegetable producers from their farms to the market in the event of future occurrences.

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